Examining the Effects of Social Anxiety and Event-level Mood Changes on Alcohol Use in Young Adults

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A Thesis

in the

Department of Psychology

Presented in Partial Fulfillment of the

Requirements for the Degree of

Master of Arts (Psychology)

at

Concordia University

Montreal, Quebec

Canada

July 2019

CONCORDIA UNIVERSITY

School of Graduate Studies

This is to certify that the thesis prepared

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Entitled: Examining the Effects of Social Anxiety and Event-level Mood Changes on Alcohol Use in Young Adults

and submitted in partial fulfillment of the requirements for the degree of

Master of Arts (Psychology – Research Option)

complies with the regulation of the University and meets the accepted standards with respect to originality and quality.

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Abstract

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Background. According to self-medication theories, individuals high in social anxiety (SA) are at risk for misusing alcohol because of its anxiolytic effects. Consistent with dual process and delayed discounting theories, the immediate relief provided by alcohol initiation is central to explaining this risk pathway. *Objective*. Ecological momentary assessments (EMAs) were used to examine mood changes within a single drinking event, and to test whether these help explain SA risk for heavy alcohol use. *Hypotheses*. Those high in SA would show decreased anxious (*tense*) and (possibly) depressed (*sad*) mood and increased positive (*happy*) mood when they first initiate alcohol. Further, steeper mood changes would predict heavier alcohol use over the night. *Method*. Undergraduates (N=229, 154 women, M_{age}=20.5 years) completed self-reports (i.e., SA) during a lab baseline. This was followed by EMAs of mood and alcohol use on smartphones (hourly 6:00pm-1:00am; morning-after 12:00pm) over four consecutive weekends. Moods from the first three hours of drinking (pre-initiation, 1st-drink, post-initiation) were examined. *Analyses*. Multilevel growth models were estimated. *Results*. Elevated SA predicted high anxious, low positive, and high depressed pre-initiation mood. Elevated SA predicted a steeper decrease in anxious (but not positive or depressed) mood across the three time-points. Within-person analyses revealed that a steeper decrease in anxious and a steeper increase in positive mood were associated with increased alcohol use over the night. *Conclusion*. Consistent with hypotheses, the results suggest that the initial anxiolytic effects of alcohol - i.e., emotional relief – may account for SA risk for alcohol misuse. Gender differences are discussed.

Keywords: social anxiety, alcohol use, EMA, mood, multilevel growth models

Acknowledgements

I would like to express my deepest gratitude to my supervisor, Dr. Roisin M. O'Connor, for her guidance, encouragement, and patience. Her dedication to the highest quality of research is remarkable, and her approach to mentorship has inspired my development as a researcher. I would also like to thank Dr. Alexandre Morin for his time and patience in answering my numerous questions. His expertise was invaluable in guiding the process of data analyses.

I would like to extend my sincere appreciation to my friends and colleagues at the Young Adult and Alcohol Research Lab. It has been a wonderful experience working together and getting to know you. A big thanks to Ghislaine Badawi, and the RAs and volunteers who worked on the Smartphone Study – without their tireless efforts, data collection would not have been possible. Lastly, I thank Ishtiaque Aziz, for never failing to provide me with hope and happiness, and my family for their unconditional love.

Support for this research came from Concordia University and the Canadian Institute of Health Research (CIHR).

Contribution of Authors

This study is part of a larger project that was designed and funded by Dr. Roisin M. O'Connor. Mayesha Khan formulated the research questions and hypotheses for the current study, under the supervision of Dr. O'Connor. Mayesha Khan coordinated participant recruitment and data collection, conducted data analyses, and wrote the manuscript. Dr. Alexandre J.S. Morin provided invaluable guidance with the statistical analyses process, and helped edit the manuscript. Dr. O'Connor provided critical feedback at every step, in addition to revisions to the final manuscript.

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Introduction

Social anxiety (SA) and alcohol use disorders have been found to co-occur at high rates – about 48% of those experiencing SA disorder also meet the diagnostic criteria for lifetime alcohol use disorder (Grant et al., 2005). Comorbidity of the two disorders affect about 2.4% of the general population (Schneier et al., 2010), is associated with greater harm than either disorder alone (Schneier, Martin, Liebowitz, Gorman, & Fyer, 1989; Schneier et al., 2010), and diminishes the success of treatments targeting either disorder (Oliveira, Bermudez, de Amorim Macedo, & Passos, 2018). SA is characterized by persistent fear, anxiety, or avoidance of one or more social or performance situations in which the individual is exposed to unfamiliar people or to possible scrutiny by others (American Psychiatric Association, 2013). Alcohol misuse or heavy/binge drinking is often characterized by consumption of 4+ drinks for women and 5+ drinks for men on a single occasion (O'Malley & Johnston, 2002). Examining the association between SA and alcohol misuse among young adults (e.g., undergraduates) provides an opportunity to identify mechanisms of risk early in the trajectory.

The undergraduate years may be particularly stressful for those high in SA, as this is a time of meeting new people, forming friendships, and experiencing new and challenging social situations (Dwyer & Cummings, 2001; Gall, Evans, & Bellerose, 2000; Tao, Dong, Pratt, Hunsberger, & Pancer, 2000). Reports estimate that about 5-10% of undergraduates experience symptoms of SA disorder at a clinical level (Purdon et al., 2001), and a higher proportion (about 23%) experience symptoms of SA occasionally (Merikangas, Avenevoli, Acharyya, Zhang, & Angst, 2002). Heavy drinking is a normative part of university life, with many social events promoting alcohol use. It is estimated that over 40% of Canadian and over 50% of US students regularly engage in binge drinking (Kuo et al., 2002; Neighbors, Pedersen, & Larimer, 2009; Yurasek et al., 2011). As undergradutes navigate social situations, where alcohol is easily accessible and heavy use is socially condoned and even encouraged, problematic patterns of alcohol use may be established for those high in SA.

SA and Alcohol Use

The self-medication hypothesis proposes that psychoactive substances (e.g., alcohol) are used by some individuals to manage or reduce negative affect (e.g., anxiety, depression) (Khantzian, 1997). In an anxiety-provoking situation, those high on SA may seek out alcohol in an effort to alleviate anxiety. The tension-reduction hypothesis explains that by providing

immediate, albeit temporary, relief of anxiety, alcohol is negatively reinforced (Conger, 1956). This process may be particularly salient for those high in SA and thus the association between alcohol and emotional relief is learned and maintained. Extending these theories, the stress response dampening model further posits that alcohol is especially effective at dampening the responsiveness to stressful or anxiety-provoking situations when used before or during a stressful event (Sher & Levenson, 1982). Accordingly, those high in SA may be at particular risk for using alcohol to alleviate anticipatory anxiety or anxiety early on in a social event. Solidifying the link between anxiety and alcohol use may lead to problematic drinking, including heavy use, adverse alcohol-related consequences, and development of alcohol use disorder later in life (Wiers et al., 2007).

In line with these theories, empirical evidence suggests that the onset of problematic drinking can follow both clinical (Kushner, Sher, & Beitman, 1990) and sub-clinical (Crum & Pratt, 2001) levels of SA. A study comparing high SA individuals and non-anxious matched controls found that high SA was associated with increased alcohol use at social events, greater relief of anxiety after drinking, and avoidance of events where alcohol was unavailable (Thomas, Randall, & Carrigan, 2003). In correlation studies, drinking specifically as a way to reduce SA has been positively associated with hazardous alcohol use (Cludius, Stevens, Bantin, Gerlach, & Hermann, 2013). In addition, hazardous drinkers who were high (vs. low) in SA have been found to report greater tension-reduction alcohol expectations, and drink heavily more often during stressful situations (Tran, Anthenelli, Smith, Corcoran, & Rofey, 2004). In experimental lab studies that evoke anxious mood and manipulate breath alcohol concentration (BrAC) level, elevated BrAC (.05 g/dl) has been linked to reduced anxiety among high SA individuals (Abrams, Kushner, Medina, & Voight, 2001). In other experimental work, following a stress task, individuals with elevated SA and impulsivity reported increased alcohol craving, and this was positively associated with reports of retrospective alcohol misuse (Adams, Rapinda, Frohlich, O'Connor, & Keough, 2019). Empirical evidence further suggests that those high in SA are at increased risk for alcohol-related consequences (Collins, Thompson, Sherry, Glowacka, & Stewart, 2018; George, Zamboanga, Millington, & Ham, 2019; Ham, Bacon, Carrigan, Zamboanga, & Casner, 2016; Howell, Buckner, & Weeks, 2016; Terlecki & Buckner, 2015; Terlecki, Ecker, & Buckner, 2014). This is consistent with the drinking motives literature, which finds that alcohol use as a way to cope with feelings of anxiety or depression is predictive of

adverse consequences, even when controlling for the amount of alcohol consumed (Bravo & Pearson, 2017; Bravo et al., 2018; Cooper, Frone, Russell, & Mudar, 1995; Clerkin & Barnett, 2012; Keough, Badawi, Nitka, O'Connor, & Stewart, 2016; Lewis et al., 2008; Stewart, Morris, Mellings, & Komar, 2006). These consequences vary from hangovers and reduced self care, to poor academic performance, blackouts, and even physical harm (Kowalczyk, Khan, & O'Connor, 2019; Merrill, Wardell, & Read, 2014).

In light of these findings, drinking alcohol should present as a conflicting behaviour for those high in SA. On the one hand, alcohol has the potential to dampen situational anxiety (Goldman, Del Boca & Darkes, 1999; Magrys & Olmstead, 2015), but on the other hand it may lead to adverse outcomes (including social embarrassment), that should be particularly salient to those high in SA. It would appear that, in order to misuse alcohol, those high in SA must disregard the potential adverse consequences in favour of in-the-moment relief. This is consistent with the delayed discounting theory (MacKillop et al., 2011), which postulates that immediate rewards are valued above delayed consequences. This process likely works through the deregulation of dual-process system, where the impulsive (automatic) and reflective (controlled) systems work in conjunction (e.g., by weighing in-the-moment relief vs. the delayed consequences) to influence behaviour (Rounds, Beck, & Grant, 2007; Wiers et al., 2007, 2010). Given the normalcy of heavy drinking in university, the automatic 'approach' response may be to continue to drink, and thus, to drink heavily. The controlled process, which would permit reflection and evaluation of the potential for negative consequences, may be impeded by both anxiety and by initial effects of alcohol intoxication (Wiers et al., 2007). Therefore it may be beneficial to investigate the initial effects of drinking in high SA individuals.

To provide a rigorous test of SA-alcohol misuse risk theories, changes in event-level mood as alcohol is initiated needs to be examined. This would allow a better understanding of how the risk mechanisms unfold during a drinking episode. Prior research with SA have explored the anxiolytic effect of alcohol retrospectively, and in simulated lab environments, but this effect has not been examined systematically at the event-level during natural drinking episodes.

Event-level Mood

Day-to-day mood with respect to SA or alcohol use has been studied using daily diaries or ecological momentary assessments (EMAs; Stone & Shiffman, 1994), where mood was

measured at pre-determined or random times throughout a day (Armeli, Conner, Cullum, & Tennen, 2010; Kashdan & Collins, 2010; Swendsen et al., 2000). These studies found that high SA predicted low levels of daily happiness and elevated anger, when daily mood was recorded at four random times per day (Kashdan & Collins, 2010). Daily reports of elevated happiness and nervousness have been associated with increased alcohol use later in the evening (Swendsen et al., 2000). Negative affect (sadness, fear) has also been associated with a cross-lagged positive feedback loop of risky drinking in the following week (Hussong, Hicks, Levy, & Curran, 2001). Further evidence of the influence of daily mood on drinking have been observed, where elevated negative mood (anger, nervousness) in the morning predicted earlier onset of drinking during the day (e.g., 5pm vs. 9 pm; Todd, Armeli, & Tennen, 2009). These studies have advanced the literature, and provided support for the influence of SA on day-to-day mood fluctuations, which in turn influenced daily alcohol use. However, these mood variables were often recorded at a time distant from the drinking episode, and so, the momentary effects of drinking on mood have not been closely examined.

To this end, the current literature can benefit from a systematic examination of changes in event-level mood upon initiating alcohol, specifically in relation to SA. With the advent of multilevel analyses in daily diary studies, researchers are now able to discriminate between trait vs. event-level variables on alcohol use (e.g., O'Hara, Armeli, & Tennen, 2015). Building on existing literature and methodology, the current study used hourly evening EMAs taken daily (from Thursday to Saturday) over four consecutive weekends to record event-level mood in young adults as they began drinking. EMAs enabled us to investigate how changes in event-level mood in the early hours of drinking influenced overall drinking, across multiple drinking days.

Gender Differences

Evidence from past studies indicate that problematic drinking may be different between males and females (e.g., Stewart, Zvolensky, & Eifert, 2001; DeMartini & Carey, 2011). These differences have been observed in drinking quantity, frequency, motives, and consequences among college students (e.g., LaBrie, Ehret, Hummer, & Prenovost, 2012; Read, Wood, Davidoff, McLacken, & Campbell, 2002). Several studies have found that men consume more alcohol than women (Booth & Hasking, 2009; Eisenberg, Johnson, & Zucker, 2018; Stewart et al., 2006). Some differences between males and females have been observed in the link between mood and drinking. Swendsen and colleagues (2000) found that men (vs. women) were more

likely to increase drinking when they reported elevated levels of daily nervous mood. In line with this finding, increased alcohol use has been associated with anxious (Kushner et al., 1994), and depressed mood (Nolen-Hoeksema & Harrell, 2002) in men, but not in women. Event-level depressed mood was found to be a precursor for alcohol use in men (Hussong et al., 2001), but a consequence of drinking for women (Poulin, Hand, Boudreau, & Santor, 2005).

In a study with socially phobic participants, greater reduction in anxiety was reported by men with high (vs. low) tension reduction expectancies from alcohol, but this effect was not found in women (Abrams & Kushner, 2004). Compared to high SA women or low SA men, men with high SA reported heavier alcohol use, and were more likely to meet the criteria for alcohol use disorders (Clements, 1999; Norberg, Norton, Olivier, & Zvolensky, 2009). Accounts of adverse consequences of alcohol use are mixed, with some reports of men experiencing more problems than women (Read, Wood, Davidoff, McLacken, & Campbell, 2002), while others have reported the opposite (Ham & Hope, 2005; Nolen-Hoeksema & Hilt, 2006). A subsequent study have found that men high in SA experienced greater physical and social problems (e.g., hangover), while women high in SA experienced more adverse role functioning (e.g., missing work) and personal (e.g., arguments with friends) consequences (Norberg, Olivier, Alperstein, Zvolensky, & Norton, 2011). These outcomes may be due to the different motives for drinking. Women high (vs. low) in SA have reported more coping-motivated drinking, but, men high in SA have reported conformity-motivated drinking; both resulted in increased overall alcohol problems (Buckner & Shah, 2015). Although drinking to cope with negative affect generally leads to alcohol problems (e.g., Buckner & Heimberg, 2010; Cooper et al., 1995; LaBrie et al., 2012), some studies have found this effect only in men, but not in women (Rutledge & Sher, 2001; Timko, Finney, & Moos, 2005).

It appears from these studies that high SA men and women may be consuming alcohol for different reasons, and that alcohol may have different effects on mood, which may be contributing to these varied outcomes. A closer inspection of the effect of alcohol on event-level mood may help clarify some of the inconsistencies. Together, these findings suggest that examinations of the link between SA, mood and alcohol use would benefit from consideration of gender differences, as the underlying mechanisms may be different.

Current Study

This study is part of a larger project assessing daily mood and alcohol use in young adults, over-recruited on high SA, over a period of four consecutive weekends using EMAs through smartphones. Event-level (or state-level) mood (anxious, positive, depressed) ratings over three consecutive hours, starting from the hour prior to initiating drinking (i.e., pre-initiation, 1st-drink, post-initiation), during each drinking event were recorded. Changes in mood over these three time points as individuals first began drinking were examined to predict overall alcohol use, as measured the morning after. Up to 12 drinking events were recorded per person to examine both event-level and between-person associations in the model.

Hypotheses

It was hypothesized that individuals higher on SA would show steeper decreases in anxious and depressed moods, and steeper increases in positive mood when they first began drinking. Further, these initial trajectory of mood (i.e., steeper slopes) would predict heavier alcohol use over the evening. Individuals higher in SA were also expected to show higher levels of pre-initiation anxious and depressed moods, and lower levels of pre-initiation positive mood. Higher pre-initiation anxious, positive and depressed moods were expected to predict increased alcohol use.

Gender Differences

The model was tested for gender differences. Men were expected to consume more alcohol overall than women, since this was frequently observed in the literature. Due to the overall mixed findings regarding the association between SA, mood, and alcohol use, it was unclear how the event-level trajectories of anxious, positive and depressed moods would vary between men and women.

Method

Participants

Two hundred thirty-three full-time undergraduate students between the ages of 18 and 25 years were recruited and screened from the greater Montreal area. Screening criteria included students who were enrolled in their first undergraduate degree, consumed alcohol at least four times in the past month, and were fluent in English. These criteria permitted the inclusion of a sample that was relatively homogenous in terms of transitional phase into adulthood, and who did not abstain from alcohol (i.e., would likely indicate drinking events within the course of this study). English fluency was a criteria as all study materials were in English. In order to have an

adequate range on SA, recruitment was done with oversampling on high SA, as determined from scores on the Social Interaction Anxiety Scale and Social Phobia Scale during screening (Mattick & Clarke, 1989) using previously established criteria (Coles et al., 2003; Habke et al., 1997; Heimberg et al., 1992; Mattick & Clarke, 1998; Weeks, Jakatdar, & Heimberg, 2010). Based on these criteria, 11% of the sample were determined to be high on SA, 83% were moderately socially anxious, while 5% were low on SA.

Four participants who reported not consuming alcohol over the 12 days (i.e., four weekends) of EMA were excluded from the current analyses. The final sample included 229 participants (154 women, M_{age}=20.5 years, 68% Caucasian). None of the participants endorsed non-binary genders. Among the participants, 21% were in first year of university, 32% in second year, followed by 27% in third year, and 19% in fourth year or higher. More than half (63%) indicated not being employed currently, while 34% and 3% reported working part-time and full-time respectively. About a third reported either growing up outside of Canada (38%) or in Quebec (30%), 19% in Ontario, and 18% in other Canadian provinces. More than half (67%) of the sample lived in apartments without their families, followed by 18% who lived at home with their families, and 14% who lived on campus. English was endorsed by 65% of the sample as the first learned language, while 17% endorsed French.

Procedure

Institutional ethics approval was obtained and ads were posted on-line (e.g., Craigslist, Kijiji, Concordia's Participant Pool) and on bulletin boards across Montreal (e.g., universities, grocery stores, bus stops, coffee shops). Interested individuals emailed the lab. They were directed to an online screening questionnaire (using FluidSurveys.com). Those meeting eligibility criteria were invited to the lab to participate in the baseline study session, which lasted approximately 90 minutes. During this session, the study procedure was explained, written informed consent was obtained, and self-report measures (e.g., demographics, social anxiety) were completed. Further, participants were instructed on how to answer daily diaries on their smartphones for the EMA component. For participants who did not own a smartphone with a data plan (N = 10), one was provided for the duration of the study. Participants were compensated with $15 or 1.5 Psychology Participant Pool credits for completion of the baseline measures.

The daily EMAs started on the Thursday following the lab session, and lasted for four consecutive weekends (Thursdays through Sundays), for a maximum of 12 drinking days. During the evenings on Thursdays, Fridays and Saturdays, participants received one assessment every hour, for eight consecutive hours starting at 6 pm and ending at 1 am. The assessments were embedded as links sent through text messages. Participants were instructed to ignore texts once they went to bed. Each assessment took approximately 2 minutes to complete. In each assessment, participants were asked to report on their current mood and alcohol use over the *past* hour. Each Friday, Saturday and Sunday at 12 pm, participants received a 'morning after' assessment, where they were asked to report the total number of drinks consumed the night before. Participants were compensated at a rate of $15 per completed day of EMA. Those responding to ≥ 90% of daily assessments overall were given a bonus of $20 to encourage compliance.

Measures

Additional self-report assessments at baseline and during the EMA were administered as part of the larger project, however, only those relevant to the current study are described below.

Demographics. Participants reported their age, gender, year in university program, ethnicity, job status (part-time, full-time, or not working), living situation (alone, on campus, or at home with parents), and languages (dominant and first learned).

Social anxiety. The Liebowitz Social Anxiety Scale (LSAS; Heimberg et al., 1999; Liebowitz, 1987) was administered at baseline, and consists of 24 social situations (e.g., "participating in small groups"), assessing fear/anxiety as well as avoidance of each of the 24 situations, using two different response scales. These items assessed both performance as well as interaction situations. Participants used 4-point response scales to rate their fear/anxiety ("0 = No Fear or Anxiety" to "3 = Severe Fear or Anxiety") and avoidance {"0 = Never Avoid (0% of the time)" to "3 = Usually Avoid (67—100% of the time)"} of each situation. Based on standard practice, the mean scores of both fear and avoidance scales were averaged to get a global SA score. The internal reliability (Crohnbach's α) of the LSAS in current sample was .940. The LSAS has high external reliability, convergence and discriminant validity (Fresco et al., 2001). The global score from LSAS was used as the measure of trait SA in the analyses, as a Level 2 (between-person) predictor. All three measures of SA were correlated with each other (SIAS-SPS: $r = .774$, SIAS-LSAS: $r = .723$, SPS-LSAS: $r = .692$, all ps $< .01$).

Alcohol use. On each evening EMA, participants reported the number of drinks they consumed over the past hour. This variable was used to identify when the first drink was consumed for each drinking day. On the morning after surveys, they were asked to report the total number of drinks consumed during the previous evening. Total alcohol use from the morning after survey was treated as a Level 1 (within-person) outcome variable. The cluster mean of this variable was used as the Level 2 outcome variable. Alcohol use was a continuous variable. The tally of total alcohol use per evening was not assessed from summing the number of drinks per hour for all evening surveys because participants did not consistently respond to all eight hourly evening surveys. Therefore, the morning after surveys provided a more reliable estimate of overall alcohol use. For the purpose of this study, we defined 'drinking days' as days when participants reported having one or more alcoholic drinks.

Event-level mood. Visual analogue scales, ranging from 0 ("not at all") to 100 ("very"), were administered during the evening hourly EMAs to assess three moods – anxious, positive and depressed. Each mood was assessed using two items: tense and anxious (anxious), happy and cheerful (positive), and sad and depressed (depressed). These mood items are consistent with those used in other undergraduate drinking research (e.g., Birch et al., 2004; Grant & Stewart, 2007; Grant, Stewart, & Birch, 2007). All mood variables were continuous. These variables had high variance due to the rating scale used. This could contribute to convergence problems in multilevel models; this issue was resolved by recoding the scores (i.e., dividing values by a constant, such as 10). Previous studies have shown excellent reliability and validity of visual analogue scales as measures of daily mood (Aitken, 1969; Gift, 1989; Little & McPhail, 1973; Remington, Tyrer, Newson-Smith, & Cicchetti, 1979; Williams, Morlock, & Feltner, 2010).

To capture changes in mood during the early stages of drinking in the evening, mood ratings over three consecutive hours – pre-initiation, 1st-drink, post-initiation – were extracted for current study analyses. Specifically, for each drinking day, the time at which individuals initiated alcohol (i.e., 1st-drink) was first identified, and the moods for that hour was extracted. Next, the moods for the hour before their first drink (i.e., pre-initiation), and the moods for the hour after their first drink (i.e., post-initiation) were also identified and extracted. The slope or change in anxious, positive and depressed moods were modeled from these three mood time points at Level 1 (corresponding to within-person day-to-day variations).

Statistical Analyses

Multilevel growth models were analyzed using Mplus 8.2 statistical package. Robust maximum likelihood (MLR) estimator and full information maximum likelihood (FIML) procedures were used to account for missing data and possible non-normality (Muthén & Muthén, 2017). The data has a hierarchical structure, with four weekends (up to 12 days) of daily assessments nested within each person. Two levels of analyses (i.e., event-level day-to-day within-person variations, and between-person), were conducted to test the associations between baseline SA, daily mood and alcohol use.

The analytic model is depicted in Figure 1. Daily mood ratings and alcohol use were modeled at Level 1 (within-person, nesting multiple drinking days per person). At Level 1, a linear latent curve specification was used to represent the evolution of participants' mood ratings over the course of each evening (i.e., using pre-initiation, 1st-drink, post-initiation moods) allowing us to synthesize these ratings by an intercept (reflecting mood at pre-initiation) and a slope (reflecting the evolution of mood over the next three hours) factor. SA and cluster means of alcohol use were modeled at Level 2 (between-person). The effect of Level 2 SA predicting the average intercept and slope of the mood for each specific individual was tested. In a second model, the effects of Level 2 predictor (i.e., SA) on relations observed at Level 1 (i.e., intercept and slope of mood predicting alcohol use) was also tested by specifying random slopes, and assessing the effects of the predictor on within-person variations on these relations (i.e., by assessing the relation between the predictors and the random slopes). All Level 1 variables were group-mean centered and Level 2 variables were grand-mean centered. The cluster means of alcohol use were first calculated in Mplus, grand-mean centered, and then used as Level 2 outcomes. Distinct models were analyzed for each of the mood variables (i.e., anxious, positive and depressed moods). Additionally, these models were also tested for gender differences.

Results

Screening and Descriptive Statistics

The morning-after survey completion rate was 93% over the duration of the EMAs. Also, 90% of the participants reported three or more drinking days, with only one individual reporting drinking on all 12 days (Table 1). There were 1,303 valid responses for morning after alcohol use, with 3.7% data missing. The number of responses for pre-initiation, 1st drink, and post-initiation moods were 791, 1,262 and 969 respectively. Between 6.7% – 41.5% data were missing for the three mood variables, with most missing for pre-initiation moods. However,

missingness in all variables were accounted for by FIML estimation (Enders, 2010). The mean number of drinks consumed within the first hour of drinking was 1.6 drinks. The highest number of drinks reported to have been consumed overall in an evening was 26. Such high alcohol use values were not excluded from analyses since individuals who reported these extreme values also had relatively high alcohol use across all of their drinking days. Additionally, these high numbers are consistent with research assessing binge drinking in undergraduates (Day-Cameron et al., 2009; Gill, 2002).

The descriptive statistics, bivariate correlations, and intraclass correlations (ICC) are presented in Table 2. SA was positively correlated with anxious and depressed mood variables at all three (pre-initiation, 1st drink and post-initiation) time points. The correlation between SA and alcohol use was not supported. The correlation between alcohol use and gender was supported, such that men reported drinking more than women, as expected. Pre-initiation, 1st drink and post-initiation anxious and depressed moods were positively correlated with each other, and negatively correlated with positive moods within each time point, as expected. The ICCs indicated that roughly 40% of variance in mood occurred at the between-person level. No evidence of bivariate collinearity (i.e., $r \geq .90$; Tabachnick & Fidell, 2001) or multicollinearity (i.e., VIFs $\geq$10, Kline, 2016; Table 2) was observed.

Level 1 Associations (Within-person)

The results of the Level 1 (event-level) analyses are presented in Table 3. The intercept and slope of anxious mood were negatively associated with alcohol use. Specifically, higher levels of pre-initiation anxious mood was associated with lower overall alcohol consumption, and steeper declines from pre- to post-initiation anxious mood were associated with increased alcohol use. In other words, individuals who were more anxious prior to alcohol initiation consumed less alcohol over the evening. However, alcohol use tended to increase linearly as anxious mood decreased during the evening.

The intercept and slope of positive (i.e., happy, cheerful) mood was positively associated with alcohol use. Specifically, higher levels of pre-initiation positive mood led to higher overall alcohol consumption, and increases from pre- to post-initiation positive mood was associated with increased use of alcohol. Thus, individuals consumed more alcohol if they experienced greater pre-initiation positive mood, and furthermore, alcohol use increased linearly as positive mood increased after initiating alcohol.

The intercept of depressed mood was negatively associated with alcohol use, indicating that high level of pre-initiation depressed mood led to decreased alcohol use, but this effect was not statistically significant (p = .062). A negative association was also found between the slope of depressed mood and alcohol use, such that decreases in depressed mood were associated with increased levels of alcohol use, but this effect was not statistically significant either (p = .073).

Level 2 Associations (Between-person)

The effect of SA on the intercept and slope of the moods was also tested (Table 3). In all models, SA was negatively associated with alcohol use, such that higher SA led to decreased alcohol use, however, this effect was not statistically significant. Elevated SA was associated with higher levels of pre-initiation anxious mood – that is, individuals high on SA tended to experience higher levels of anxious mood in the hour before they began drinking. Moreover, individuals with elevated SA also experienced a steeper decrease in anxious mood once alcohol was initiated. Elevated SA was associated with elevated levels of pre-initiation depressed mood, and with lower levels of pre-initiation positive mood. This indicates that individuals with elevated SA were more likely to experience higher levels of depressed mood and lower levels of positive mood prior to drinking. However, SA did not predict changes in the trajectories of positive or depressed moods across the three time points.

Cross-level Interactions

Random slopes analyses were conducted to test the cross-level moderating effect of SA on the association between mood and alcohol use. Follow-up simple slope analyses were conducted when the moderating effect of SA was supported by the data in order to more specifically assess the scope of the association between mood and alcohol use at low (1 SD under the sample mean) and high (1 SD above the sample mean) levels of SA. The results are presented in Table 4.

The associations between anxious or positive moods and alcohol use were not moderated by SA. In contrast, the associations between alcohol use and pre-initiation depressed mood, and depressed mood trajectory, were moderated by SA. Simple slopes analyses revealed that in both low and high SA individuals, the association between pre-initiation depressed mood and alcohol use was negative, however the results indicate that the decrease in alcohol use (with increasing pre-initiation depressed mood) was less in those high in SA (*Intercept* = -2.635, *SE* = 0.491, p = 0.000) compared to those low in SA (*Intercept* = -4.229, *SE* = 0.948, p = 0.000) (Figure 2). In

other words, elevated pre-initiation depressed mood led to reduced alcohol use in general, but for individuals high on SA, this effect was less pronounced. As the rate of change (i.e., decrease) in depressed mood increased, alcohol use also increased in both low and high SA groups (Figure 3). However, this effect was more pronounced in low SA individuals (low SA: *Intercept* = 4.589, *SE* = 1.991, $p = 0.021$; high SA: *Intercept* = 2.352, *SE* = 1.094, $p = 0.032$). This indicates that while more pronounced decreases in depressed mood led to increased drinking in general, this effect was stronger in those who are low on SA, but not for those high on SA.

Gender Differences

Since gender differences were evidenced in SA-alcohol use literature, possible differences were assessed via a combination of multigroup multilevel growth modeling and additional tests of interactions effects. Indeed, the complexity of the models estimated here made it impossible to directly test gender differences or interactions on the whole set of model parameters simultaneously. We thus relied on a combination of multiple group models to assess most possible gender differences, but were able to include more formal tests of interactions for the critical effects of SA. In the first set of multigroup models, the Mplus MODEL constraint function (which relies on the multivariate delta method to test group differences; Raykov & Marcoulides, 2004) was used to assess the statistical significance of differences between men and women on all coefficients. The mean alcohol use was statistically significantly different ($p = .002$) for men and women (men: 5.418; women: 4.201). This was expected, as men usually report drinking more than women (e.g., Booth & Hasking, 2009; Eisenberg et al., 2018; Stewart et al., 2006). Severity of SA was statistically different ($p = .027$) for men and women (women: 0.877; men: 0.753). The association between the anxious mood trajectory and alcohol use was also different ($p = .000$) between genders. In women, the slope of anxious mood was positively associated with alcohol use (*B* = 20.629, *SE* = 1.365, $p = .000$), while in men the slope was negatively associated with alcohol use (*B* = -3.545, *SE* = 1.482, $p = .017$). This indicates that in men steeper decreases in anxious mood were linked to consuming more alcohol, while in women increased alcohol use was associated with a slower decrease in anxious mood.

Then, in order to assess gender differences for SA on associations between mood and alcohol use, the interaction effect of for SAxGender was directly tested. No differences between men and women were observed for the effect of SA on the relation between anxious or positive moods and alcohol use. However, statistical differences were observed between levels of SA and

the relation between depressed mood trajectory and alcohol use (B = 306.792, SE = 53.34, p = .000). In other words, the association between depressed mood trajectory and alcohol use varied as a function of both SA and gender (Figure 4). Simple slope analyses revealed a positive association between depressed mood trajectory and alcohol use in both men and women who were high on SA, however, a negative association was observed for women who were low on SA (Table 7). This indicates that high SA individuals consumed more alcohol when depressed mood was alleviated at a slower rate over the three time points, but, this effect was opposite in women low in SA, who consumed more alcohol when depressed mood was alleviated more rapidly over the three time points.

Discussion

Using EMAs over three consecutive evening hours taken over the course of 12 days for four consecutive weekends, the current study examined how changes in event-level mood influenced overall alcohol use during a drinking event. Consistent with hypotheses, the findings suggest that change in mood early in a drinking event may account for SA risk for alcohol misuse.

SA and Alcohol Use

Evidence supporting associations between high SA and increased alcohol use are inconsistent in the extant literature, with some studies reporting negative relations or no associations at all (e.g., Gilles et al., 2006; Ham & Hope, 2005; Morris, Stewart, Theakston, & Mellings, 2004). Our results fit with this observation, as we did not find any direct associations between SA and alcohol use. Instead, SA influenced alcohol use through proximal event-level variables, highlighting the advantages of EMA studies and multilevel analyses. SA predicted event-level moods, and their evolution over the first three hours of a drinking event, which in turn predicted alcohol use.

Individuals high in SA reported increased event-level anxiety prior to consuming the first drink of the evening. This observation was consistent with daily mood and alcohol studies in the literature, where elevated SA has been associated with increased daily negative affect (Kashdan & Collins, 2010). High SA was associated with steeper decreases in pre- to post-initiation anxious mood in the current sample. This observation was consistent with the tension reduction hypothesis (Conger, 1956) and stress response dampening model (Sher & Levenson, 1982), suggesting an anxiolytic effect of alcohol in the early stages of drinking, which was stronger for

those high in SA. This trajectory also fits with empirical evidence (Thomas et al., 2003; Tran et al., 2004) that individuals high in SA report alcohol to be more effective at reducing anxiety than those low in SA. Moreover, steeper decreases from pre- to post-initiation anxious mood were associated with increased alcohol use. Thus, in the current study, elevated SA indirectly predicted increased alcohol use, through the trajectory of event-level anxiety.

Contrary to our expectations, higher levels of pre-initiation anxious mood led to reduced alcohol use. This fits with a recent study, where elevated trait anxiety was associated with lower drinking frequency and reduced drinks per drinking days (McCaul, Hutton, Stephens, Xu, & Wand, 2017). Another study similarly found that high SA men report lower drinking frequency than men lower in anxiety (Norberg et al., 2009). However, our result was contrary to the self-medication hypothesis (Khantzian, 1997), as well as evidence that linked increased daily nervousness with increased alcohol use later in the day (Swendsen et al., 2000). This difference may lie in the specificity of negative mood (nervousness vs. anxious) that was recorded. Alternatively, perhaps highly anxious individuals reduce alcohol use to prevent additional stressors in an already anxious situation. Since high SA is linked to greater problems (George et al., 2019; Ham et al., 2016), drinking less may also help to avoid potentially negative or embarrassing consequences. These results suggest that elevated anxiety before drinking by itself may not be predictive of heavy drinking. Rather, in socially anxious individuals, a quick relief of pre- to post-initiation anxiety may lead to increased drinking.

Consistent with some previous research (Kashdan & Collins, 2010), positive (i.e., happy, cheerful) mood before consuming alcohol was lower in individuals with elevated SA. As hypothesized, higher levels of pre-initiation positive mood, and its maintenance from pre- to post-initiation of alcohol, led to increased drinking. This is in line with studies where pre-drinking happiness (Geiger & MacKerron, 2016), and high levels of daily happiness (Swendsen et al., 2000), positively predicted alcohol use. Our finding extends current literature by accounting for positive mood in the hour immediately prior to initiating drinking. These results were not surprising and consistent with delayed discounting (MacKillop et al., 2011) and dual process (Wiers et al., 2007, 2010) theories, which theorize that momentary mood enhancement can influence addictive behaviours. Furthermore, these results were also consistent with prior research suggesting that drinking for positive reinforcement was associated with increased

alcohol use (Kuntsche, Stewart, & Cooper, 2008; Kuntsche et al., 2014; Mohr, McCabe, Haverly, Hammer, & Carlson, 2018; Read, Wood, Kahler, Maddock, & Palfai, 2003).

As hypothesized, socially anxious individuals experienced increased pre-initiation depressed mood, similar to what was found with anxious mood. Co-occurrence of anxiety and depression have been found in the extant literature (e.g., Erwin, Heimberg, Juster, & Mindlin, 2002), thus this observation may not be surprising. In addition, evidence also links high SA with increased depressive symptoms (Thomas, Thevos, & Randall, 1999).

Consistent with our hypothesis, SA moderated the event-level association between depressed mood and alcohol use. Overall, individuals consumed less alcohol when pre-initiation depressed mood was high. However, this effect was less pronounced in individuals high in SA. Specifically, the tendency to drink less, when feeling sad prior to drinking, was weaker in high (vs. low) SA individuals. This observation was partially consistent with the hypotheses, since elevated pre-initiation depressed mood was expected to be positively associated with drinking. This result is also consistent with a review paper (Pedrelli, Shapero, Archibald, & Dale, 2016) that examined depressive symptoms and alcohol use in young adults, and found inconsistencies in this association. Moreover, small effect sizes were found in the studies that showed a positive relation between depressive symptoms and alcohol use. Research with adolescents have revealed that the association between depressed mood and drinking is usually lessened over time (Owens & Shippee, 2009; White, Kraus, & Swartzwelder, 2006), and so this may be a pattern that continues in to young adulthood. Since heavy drinking is normative in young adults, Pedrelli et al. (2016) theorized that motives for drinking may not be limited to negative mood, which may be contributing to the mixed findings. However, a part of our findings was consistent with the tension reduction hypothesis and evidence suggesting that higher levels of SA may be linked to alcohol abuse (Crum & Pratt, 2001) or dependence (Buckner et al., 2008). Although elevated pre-initiation depressed mood was linked to less drinking, high SA individuals still reported drinking more than their low SA peers.

Decreases in depressed mood from pre- to post-initiation led to increased drinking in general, but this effect was stronger in low (vs. high) SA individuals. Specifically, when SA was low, the quick relief of depressed mood, within the three time points, was linked to increased alcohol use. But when SA was high, depressed mood declined at a comparatively slower pace, which in turn led to increased drinking. This is contrary to what was found with the anxious

mood trajectories (i.e., steeper pre- to post-initiation anxiolytic effect driving heavy drinking), but it is important to note that depressed mood and anxiety often result in distinctive alcohol use patterns (Grant, Stewart, O'Connor, Blackwell, & Conrod, 2007). In socially anxious individuals, event-level anxiety can be caused by an impending social interaction and may subside once the interaction is underway or has concluded, but depressive symptoms may take longer to regulate (Ledley et al., 2005). There is evidence that individuals with high SA exhibit increased depressive symptoms (Thomas et al., 1999), and this is associated with reduced efficacy for SAD treatments (Ledley et al., 2005). This may be indicative of distinct interactions between depressed mood and high SA: socially anxious individuals may be at increased risk of heavy drinking to cope with depression particularly when their feelings of sadness do not subside quickly. Further, the differences in anxious vs. depressed mood trajectories may be due to the differences in coping-motivated drinking for anxiety vs. depression in socially anxious individuals (Stewart et al., 2006; Thomas et al., 2003). Findings from the current study are in line with research that have found distinctive alcohol use patterns with anxious and depressed moods. It is, therefore, necessary to consider that the trajectory of depressed mood with alcohol consumption may be more complex when SA is elevated. Although individuals may prefer not to engage in heavy drinking when depressed, at elevated levels of depressed mood, if high SA individuals are already drinking, they may be likely to drink more than those who are low in SA.

Gender Differences

Consistent with our hypotheses and with previous research (Booth & Hasking, 2009; Eisenberg et al., 2018; Stewart et al., 2006), men reported consuming more alcohol overall than women. Such high use may reflect the higher rates of alcohol use disorders observed in men (Clements, 1999). Women reported higher levels of SA than men, and this is consistent with some previous research (Booth & Hasking, 2009; Leach et al., 2008). Gender differences were observed in the trajectory of event-level anxious, but not positive, mood as alcohol was initiated. Relief of pre- to post-initiation anxious mood led to increased alcohol use in men, however, a slower reduction in anxiety in these three hours led to increased alcohol use in women. In other words, in line with the tension reduction hypothesis (Conger, 1956), men drank more when their anxiety was quickly abated through alcohol. Women, however, tended to drink more in events when their anxiety was not lessened as quickly through drinking. This observed effect in women is in line with Norberg and colleagues (2010) who found that women drank more in aversive

situations than men. Thus, increased drinking in women may have been driven by sustained feelings of anxiety. Among undergraduates, men have been found to rely more on drinking to cope than women (Park & Levenson, 2002). Thus perhaps the comparatively faster anxiolytic effect early in the drinking episode (i.e., pre- to post-initiation) reinforced coping-motivated drinking in men, more so than in women. Coping-motivated drinking is linked to adverse consequences (Cooper et al., 1995), and this may also account for the gender differences observed in alcohol-related problems. The results from the current study are indicative of different underlying mechanisms accounting for the initial anxiolytic effect and alcohol misuse between men and women.

Upon unpacking the depressed mood trajectory, our results revealed that both men and women with high SA consumed more alcohol when their depressed mood was alleviated at a relatively slower rate pre- to post-initiation of alcohol. In contrast, women low in SA consumed more alcohol when depressed mood was alleviated comparatively rapidly, but this effect was not observed in men low in SA. This observation may be indicative of depressed mood subsiding more quickly in low SA women (Thomas et al., 1999; Ledley et al., 2005). As discussed in the previous section, the trajectory of depressed mood with alcohol consumption may be different from anxiety, with elevated SA. Furthermore, the mechanisms influencing drinking in low SA women may also be different because they tend to experience less alcohol-related consequences per drinking episode than women high in SA (Norberg et al., 2009). This may lead to less apprehension regarding heavy drinking, and in turn predict steeper declines in depressed mood. Additionally, it is also possible that this effect was not observed in low SA men due to their smaller number ($N = 75$) in this sample. Nonetheless, these findings support differences between men and women in the event-level negative reinforcement effects of alcohol. However, when considering socially anxious individuals, the similarities between genders may be more relevant than the differences, as the data showed similar findings in both men and women who were high in SA.

Limitations and Future Directions

Despite its strengths, this study has some limitations. Although momentary assessments gave us insight into the early hours when participants were drinking, it is important to note that this was a snapshot of only four weekends in their lives. There may be external factors not being accounted for that may have influenced their drinking (e.g., midterms). In addition, the first

reported drink may not be their actual first drink of the evening if they skipped the first few diary entries. The results from the current study cannot be generalized to non-students, since the etiological mechanisms of the SA-mood-problematic drinking pathways may be different. Another concern with EMA studies involve the accuracy with which potentially intoxicated individuals report their drinking behaviour. However, studies that have used the EMA procedures usually report reasonably good reliability, and given the confidentiality and ease of responding, participants are unlikely to misreport voluntarily (Shiffman, 2009). Moreover, in the current study, the evening surveys were concise, the compliance rate was over 90%, and the morning after surveys were used to confirm substance use reported from the previous evening. Lastly, when interpreting the gender differences observed in this study, the unequal proportion of males and females should be taken into consideration.

Further research delineating event-level mood and alcohol use are warranted. Future studies can extend these findings by examining mood and alcohol use for a longer period of time in a drinking event, and in a larger sample. This is particularly recommended to better understand the trajectory of depressed mood. There may be other factors, such as event-level drinking motives or social context, that influences SA and drinking, and thus examining these variables may help clarify the SA risk mechanisms. These findings can inform interventions geared towards providing high SA individuals with effective emotion-regulation skillset. With proper intervention at the university level, young adults can learn to identify and manage event-level anxiety or depression, and be more aware of their decision-making process when engaging in drinking. Theory suggests that using alcohol to self-medicate is a learned response. Therefore, if the reinforcement cycle of learning can be severed early on, it could help prevent at-risk individuals from developing alcohol dependence.

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Appendix: Tables and Figures

Table 1. Number of drinking days reported by participants

Number of drinking days	N (participants)	Percent
0	4	1.7
1	5	2.1
2	16	6.9
3	24	10.3
4	26	11.2
5	34	14.6
6	34	14.6
7	23	9.9
8	27	11.6
9	20	8.6
10	12	5.2
11	7	3.0
12	1	0.4
Total	233	100.0

Table 2: Bivariate correlations and descriptives for all variables, and multicollinearity test for within-person variables.

Variables	1	2	3	4	5	6	7	8	9	10	11	12
						Correlations						
(1) Gender	1											
(2) Social Anxiety	-.090**	1										
(3) Alcohol Use	.196**	.011	1									
Anxious Mood												
(4) Pre-Initiation	-.020	.050	-.052	1								
(5) 1st Drink	-.014	.063*	-.098**	.743**	1							
(6) Post-initiation	-.016	.062	-.117**	.684**	.758**	1						
Positive Mood												
(7) Pre-Initiation	-.017	.013	.060	-.439**	-.351**	-.294**	1					
(8) 1st Drink	-.081**	-.007	.103**	-.366**	-.494**	-.412**	.687**	1				
(9) Post-initiation	-.037	-.030	.142**	-.300**	-.391**	-.459**	.566**	.697**	1			
Depressed Mood												
(10) Pre-Initiation	-.033	.023	-.038	.690**	.585**	.556**	-.614**	-.476**	-.398**	1		
(11) 1st Drink	-.028	.036	-.079**	.617**	.723**	.621**	-.452**	-.621**	-.494**	.759**	1	
(12) Post-initiation	-.015	.057	-.096**	.573**	.627**	.700**	-.363**	-.516**	-.642**	.669**	.767**	1
Descriptives												
Mean		0.84	4.62	22.07	19.27	17.23	67.76	72.21	72.28	17.08	15.36	15.35
SD		0.40	3.53	23.51	21.55	20.33	21.16	20.10	21.07	19.45	18.30	18.68
ICC				0.515	0.492	0.440	0.329	0.427	0.378	0.400	0.417	0.387
Collinearity Statistics												
Tolerance				0.337	0.249	0.268	0.327	0.279	0.316	0.248	0.220	0.218
VIF				2.970	4.017	3.733	3.057	3.589	3.169	4.030	4.535	4.597

Note. ** $p < 0.01$, * $p < 0.05$ (2-tailed). ICC = Intraclass Correlations for mood variables.

Table 3. Multilevel growth models assessing alcohol use, social anxiety and state mood (anxious, positive, and depressed).

	Anxious		**Positive**		**Depressed**	
	B (SE)	*p*	*B (SE)*	*p*	*B (SE)*	*p*
Intercept	0.000 (0.169)	0.998	0.000 (0.169)	1.000	0.000 (0.169)	1.000
Within-person (Level 1)						
AU ON the intercept of the trajectories	**-0.265 (0.131)**	**0.044**	**0.297 (0.086)**	**0.001**	-0.220 (0.118)	0.062
AU ON the slope of the trajectories	**-1.322 (0.551)**	**0.016**	**1.223 (0.476)**	**0.010**	-0.915 (0.509)	0.073
Between-person (Level 2)						
AU ON SA	-0.813 (0.447)	0.069	-0.815 (0.447)	0.069	-0.815 (0.447)	0.069
Intercept ON SA	**1.562 (0.334)**	**0.000**	**-1.106 (0.246)**	**0.000**	**0.932 (0.305)**	**0.002**
Slope ON SA	**-0.223 (0.102)**	**0.029**	0.023 (0.086)	0.789	-0.001 (0.088)	0.989
Variances						
U_{0j}	6.527 (1.144)	0.000	6.526 (1.144)	0.000	6.526 (1.144)	0.000
e_{ij}	6.298 (0.690)	0.000	6.321 (0.671)	0.000	6.439 (0.694)	0.000
Intercept	2.427 (0.639)	0.000	1.741 (0.358)	0.000	1.291 (0.368)	0.000
Slope	-0.020 (0.106)	0.853	0.118 (0.066)	0.076	-0.013 (0.066)	0.838
Model Fit						
$\chi 2$	2.95	0.567	1.14	0.888	11.06	0.026
RMSEA	0.00		0.00		0.036	
CFI	1.00		1.00		0.986	
TLI	1.01		1.01		0.943	

Note. Unstandardized beta coefficients are reported. AU = Alcohol Use, SA = Social Anxiety, U0j = Level 2 variance, eij = Level 1 variance, RMSEA = Root Mean Square Error of Approximation, CFI = Comparative Fit Index, TLI = Non-Normed-Fit Index/Tucker Lewis Index.

Table 4. Multilevel random slope models assessing alcohol use, social anxiety and state mood (anxious, positive, and depressed).

	Anxious		**Positive**		**Depressed**	
	B (SE)	*p*	*B (SE)*	*p*	*B (SE)*	*p*
Intercept	0.000 (0.169)	1.000	-0.001 (0.169)	0.996	-0.001 (0.169)	0.997
Within-person (Level 1)						
AU ON the intercept of the trajectories (S1)	**-0.265 (0.131)**	**0.044**	**0.297 (0.086)**	**0.001**	-0.220 (0.118)	0.062
AU ON slope of the trajectories (S2)	**-1.322 (0.551)**	**0.016**	**1.223 (0.476)**	**0.010**	-0.915 (0.509)	0.073
Between-person (Level 2)						
AU ON SA	-0.815 (0.447)	0.069	-0.816 (0.447)	0.068	-0.815 (0.447)	0.069
Cross-level						
S1 ON SA	0.242 (0.209)	0.248	0.053 (0.724)	0.941	**1.911 (0.672)**	**0.004**
S2 ON SA	4.768 (2.651)	0.072	-0.607 (1.516)	0.689	**-2.633 (1.310)**	**0.044**
Variances						
U_{0j}	6.526 (1.144)	0.000	6.523 (1.143)	0.000	6.540 (1.149)	0.000
e_{ij}	1.403 (0.223)	0.000	2.085 (0.258)	0.000	1.390 (0.286)	0.000
S1	0.131 (0.071)	0.066	3.724 (0.973)	0.000	5.981 (0.877)	0.000
S2	88.597 (16.475)	0.000	1.906 (0.521)	0.000	10.992 (2.859)	0.000

Note. Unstandardized beta coefficients are reported. S1 and S2 refer to the random slopes. AU = Alcohol Use, SA = Social Anxiety, U_{0j} = Level 2 variance, eij = Level 1 variance.

Table 5. Multilevel random slope moderation models assessing gender differences in the moderating effect of social anxiety on the association between alcohol use and depressed mood trajectory.

	High SA				**Low SA**			
	Women		**Men**		**Women**		**Men**	
	Estimate *(SE)*	*p*	Estimate *(SE)*	*p*	Estimate *(SE)*	*p*	Estimate *(SE)*	*p*
Between-person (Level 2)								
S2 ON SA	-11.689 (2.423)	0.000	-11.608 (2.569)	0.000	5.344 (3.210)	0.096	-3.389 (2.262)	0.134
S2 ON Gender	-3.605 (1.345)	0.000	2.660 (1.326)	0.045	9.814 (2.047)	0.000	-9.701 (2.188)	0.000
S2 ON SAxGender	6.174 (2.932)	0.035	3.358 (7.220)	0.642	-8.250 (2.990)	0.006	7.784 (4.198)	0.064
Intercept								
AU	1.654 (0.556)	0.003	4.818 (0.812)	0.073	1.050(0.603)	0.082	-0.591 (0.364)	0.105
S2	**5.746 (1.885)**	**0.002**	**10.427 (4.123)**	**0.002**	**-11.281 (1.923)**	**0.000**	-0.945 (1.968)	0.631

Note. Unstandardized beta coefficients are reported for Level 2 associations. S2 denotes AU ON the slope of depressed mood trajectories, SA = Social Anxiety, AU = Alcohol Use.

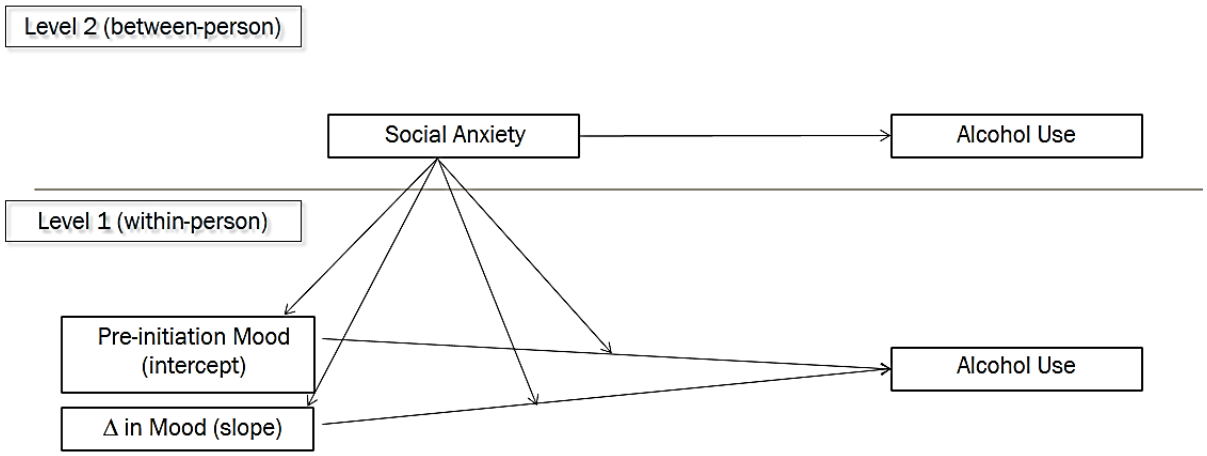

Figure 1. Analytical path model.

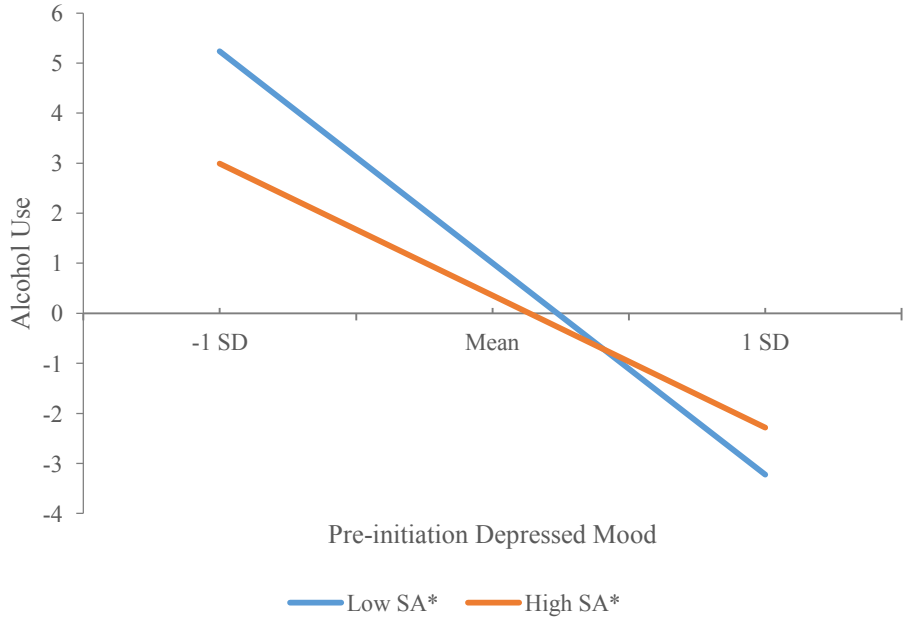

Figure 2. Simple Slopes: Pre-initiation depressed mood predicting alcohol use as moderated by social anxiety (SA). *Note*. * denotes statistically significant slopes.

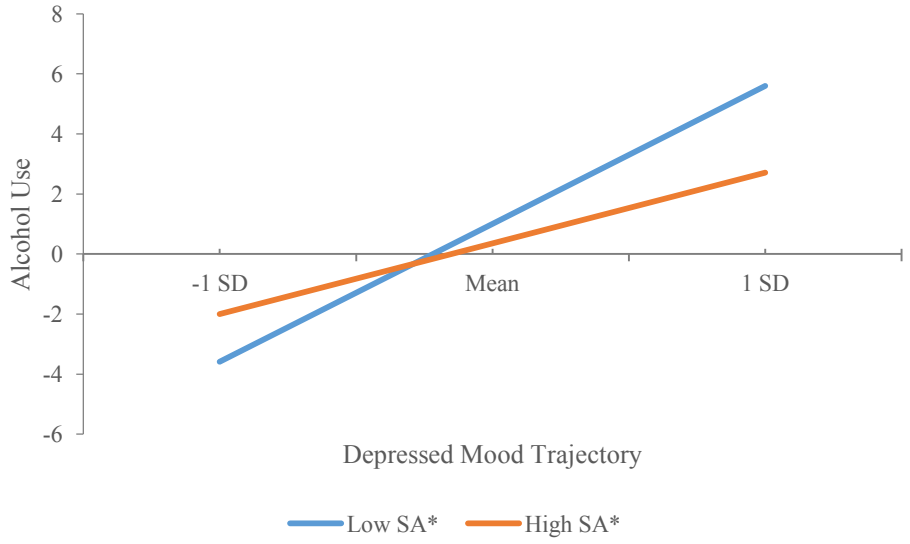

Figure 3. Simple Slopes: Depressed mood trajectory predicting alcohol use as moderated by social anxiety (SA). *Note*. * denotes statistically significant slopes.

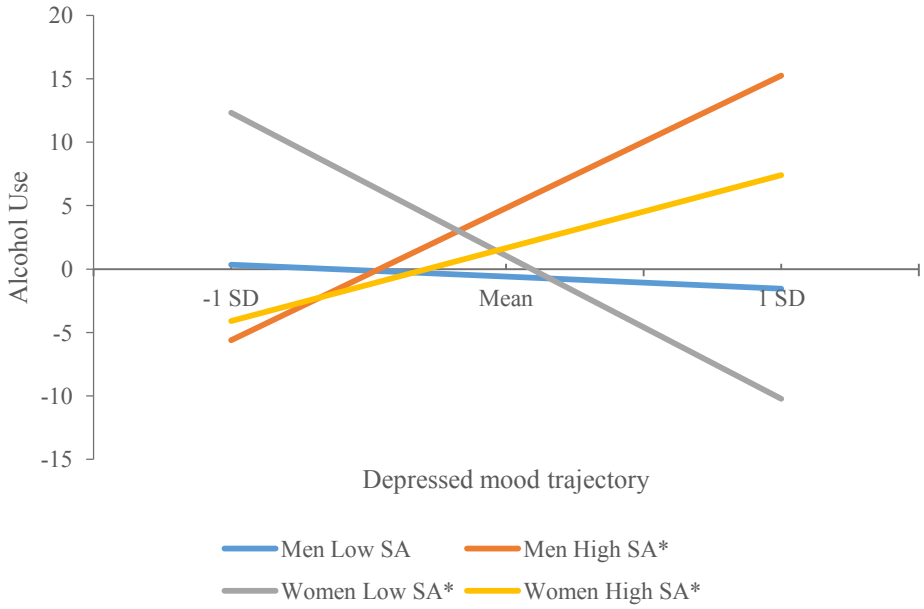

Figure 4. Simple Slopes: Gender differences in depressed mood trajectory predicting alcohol use as moderated by social anxiety (SA). *Note*. * denotes statistically significant slopes.